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EXAMINER

GILMAN, ALEXANDER

ART UNIT

PAPER NUMBER

2833

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/547,561

Applicant(s)

MATHIEU ET AL.

Examiner

Alexander Gilman

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-36 and 38-82 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36, 38-82 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other:

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. Claims 1- 6, 8-15, 18- 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Smith et al.

With regard to claims 1-3, 8, Smith et al (US Pat. 5,613,861) disclose (Fig. 6) a system comprising :

a first substrate (14) with a plurality of first contact nodes (13) formed on the first substrate and a plurality of free-standing resilient interconnection elements (15) electrically contacts a corresponding a corresponding the contact nodes;

a second substrate (101) having a plurality of second contact nodes (3),

wherein the interconnection element (15) comprises:

a first element material adapted to be coupled to a substrate, and

a second different element material adapted to be coupled to the first element material, (col. 4, lines 42-44); and one of the first element material and the second element material comprises a material having transformable property such that upon transformation, a geometrical shape of the interconnection element is irreversibly modified (col.5, lines 3-8),

wherein the interconnection element has a portion thereof which is capable to a first position to contact with one of second contact nodes.

With regard to claim 4, Smith et al disclose that the transformable property is such that a first volume is adapted to be transformed to a different second volume.

With regard to claim 5, Smith et al disclose that the second element material overlies the first ( for example, considering the first element as a non-conductive element, according to col. 4, lines 42-43).

With regard to claims 6, 20, Smith et al disclose that a transformation of the first and second material element is a result of exposing the first and/or second element to heat (col. 6, lines 36-39, specifically - the thermal evaporation).

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With regard to claims 9, 11, Smith et al disclose the second element is introduced by plating and more specifically electroless plating (col. 6, lines 36-39 and col. 8, lines 61-62).

With regard to claim 10, Smith et al disclose the second element is introduced by sputtering (col. 6, lines 39-40).

With regard to claims 14, 15, , Smith et al disclose the second element comprises nickel or nickel alloy (col. 4, lines 44-46).

With regard to claim 18, Smith et al disclose that transformable property is a stress and transformation reduces the magnitude of the stress of the material (col. 5, lines 19-21).

With regard to claims 19, 21, Smith et al disclose that the second element material tensile and compressive stress and a deformation is a response to these stresses (col. 5, lines 11-21).

#### ***Claim Rejections - 35 USC § 103***

1. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al.

Smith et al, respectively disclose all of the limitations except for:

transformation comprises at least 90 percent of transformable volume change of the second element material (claims 7, 29, 60 );

the spring material, coupled to the second element material, comprising at least about 90 percent of the interconnection element. (claim 34 and 65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to discover the claimed quantitative characteristics of the transformability volume and percent of spring material in the interconnection element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

2. Claims 12, 13, are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al in view of Eldridge et al.

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Smith et al disclose all of the limitations except for the first element material comprising palladium or its alloy.

Eldridge et al (US Pat. No. 5,832,601) disclose the first element material comprising palladium or its alloy (col. 14, lines 6-10).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al interconnection element comprising palladium or its alloy, as taught by Eldridge et al, as an alternative material for the first element.

3. Claims 16, 17, 22- 28, 30-32, 35, 38-44, 46, 48-51, 55-59, 61-63, 66, 69-79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al in view of Faraci et al.

With regard to claims 16, 17, 22, 24, 30, 44, 48, 51, 55, 61, 68 75, 76, and 79 Smith et al (US Pat. 5,613,861) disclose (Fig. 6) a system comprising :

a first substrate (14) with a plurality of first contact nodes (13) formed on the first substrate and a plurality of free-standing resilient interconnection elements (15) electrically contacts a corresponding a corresponding the contact nodes;

a second substrate (101) having a plurality of second contact nodes (3),

wherein the interconnection element (15) comprises:

a first element material adapted to be coupled to a substrate, and

a second different element material adapted to be coupled to the first element material,

(col. 4, lines 42-44); and one of the first element material and the second element material comprises a material having transformable property such that upon transformation, a geometrical shape of the interconnection element is irreversibly modified (col.5, lines 3-8),

wherein the interconnection element has a portion thereof which is capable to a first position to contact with one of second contact nodes.

Smith et al disclose all of the limitations except for the second element material comprising a shape memory alloy.

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Faraci et al (US Pat. No. 5,810,609) disclose the second element material comprising a shape memory alloy (col. 14, lines 6-10).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al interconnection element comprising a shape memory alloy, as taught by, Faraci et al, to improve the Smith et al interconnection element elastic qualities..

With regard to claims 25, and 56, Smith et al when modified by Faraci et al disclose all of limitations as applied to claim 4 above.

With regard to claims 27, and 58, Smith et al when modified by Faraci et al disclose all of limitations as applied to claim 5 above.

With regard to claims 28, 40, 59, and 71, Smith et al when modified by Faraci et al disclose all of limitations as applied to claims 6 and 20 above.

With regard to claims 31, and 62, Smith et al when modified by Faraci et al disclose all of limitations as applied to claims 9 and 11, above.

With regard to claims 32, and 63, Smith et al when modified by Faraci et al disclose all of limitations as applied to claim 10 above.

With regard to claims 35, and 66, Smith et al when modified by Faraci et al disclose all of limitations as applied to claims 14 and 15, above.

With regard to claims 38, and 69, Smith et al when modified by Faraci et al disclose all of limitations as applied to claim 18 above.

With regard to claims 39, 41, 70, and 72, Smith et al when modified by Faraci et al disclose all of limitations as applied to claims 19 and 21 above.

With regard to claim 23, Smith et al when modified by Faraci et al disclose a plurality of conductive signal lines associated with the substrate and the base of the interconnection element electrically contacts a corresponding one of the signal lines and (col. 4, lines 51-53).

With regard to claim 26 and 57, Smith et al when modified by Faraci et al disclose (Fig. 10-13) the free portion of the interconnection element material is initially fixed to the substrate (Fig. 11) and when

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the free portion is released from the substrate, the free portion is adapted to be biased away (col. 8, lines 43-45; Fig. 12).

With regard to claims 42, 43, 73, and 74 Smith et al when modified by Faraci et al disclose (Fig. 28).that the interconnection elements are coupled to more than one surface of the substrate and the first and the second contact points coupled through the re-distribution line and used as a part of a wafer-level test assembly.

With regard to claims 46, 49, 77, and 78, Smith et al when modified by Faraci et al disclose that the substrate comprises a component of a probe card (Fig. 29)

With regard to claim 50, Smith et al when modified by Faraci et al disclose the assembly is a part of a wafer-level test assembly (Fig. 26).

4. Claims 33, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al in view of Eldridge et al.

Smith et al when modified by Faraci et al disclose all of the limitations except for the first element material comprising palladium or its alloy.

Eldridge et al (US Pat. No. 5,832,601) disclose the first element material comprising palladium or its alloy (col. 14, lines 6-10).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al interconnection element comprising palladium or its alloy, as taught by Eldridge et al, as an alternative material for the first element.

5. Claims 29, 34, 60, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Faraci et al.

Smith et al when modified by Faraci et al, respectively disclose all of the limitations except for:

transformation comprises at least 90 percent of transformable volume change of the second element material (claims 29, 60 );

the spring material, coupled to the second element material, comprising at least about 90 percent of the interconnection element. (claim 34 and 65).

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to discover the claimed quantitative characteristics of the transformability volume and percent of spring material in the interconnection element, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

6. Claims 34, 36, 47, 52-54, 65, 67, and 80-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al in view of Faraci et al and further in view of Dozier II et al.

With regard to claims 34 and 65, Smith et al when modified by Faraci et al disclose all of the limitations except for a spring material coupled to the second element material.

Dozier II et al (US Pat. NO. 5,772,451) disclose (Fig. 2A) a spring material coupled to the second element material (col. 15, lines 44-50).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al second element with the spring material coupled to the second element material, as taught by Dozier II et al, to improve the Smith et al interconnection element elastic qualities. With regard to claim 36 and 67, Smith et al disclose (Fig. 13) a contact material (19) adjacent a surface of the spring material (col. 8, lines 61, 62).

With regard to claim 47, Smith et al when modified by Faraci et al disclose all of the limitations except for the substrate comprising a socket for releasably connecting the electronic assembly to an electronic component.

Dozier II et al (US Pat. NO. 5,772,451) disclose (Fig. 3) the substrate (310) comprising a socket for releasably connecting the electronic assembly to an electronic component.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al substrate comprising a socket for releasably connecting the electronic assembly to an electronic component, as taught by Dozier II et al, to utilize the interconnection elements for LGA-sockets.

With regard to claims 52 and 80, Smith et al when modified by Faraci et al and Dozier II et al disclose (Dozier et al, Fig. 3) the second contact nodes (308) comprise external connection points.



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With regard to claims 53, 54, 81, and 82, Smith et al when modified by Faraci et al and Dozier II et al disclose (Dozier et al, Fig. 3):

the third substrate (302) and a plurality of third contact nodes (306) (claims 53 and 81);

a stop structure (336) disposed on the first substrate (claims 54 and 82).

7. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al in view of Faraci et al and further in view of Khandros et al.

Smith et al when modified by Faraci et al disclose all of the limitations except for the substrate comprising an interposer.

Khandros et al (US Pat. NO. 5,994,152) disclose (col. 14, lines 24-34) the substrate comprising an interposer

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the Smith et al substrate comprising an interposer, as taught by Khandros et al, to utilize the interconnection elements for interposers.

### ***Response to Arguments***

Applicant's arguments filed 09/03/2002 have been fully considered but they are not persuasive.

With regard to claims 1 and 48, Applicants argue that the prior art (Smith et al) discloses the stress gradient responsible for the form of the spring contact while the transformable property of the material in the Applicants' invention is not introduced by bending the element.

Claims 1 and 48 do not claim which factor is responsible for changing form of the spring contact. The claims simply claim material having a transformable property that is the material which is able to change its geometrical form. The Smith et al contact is able to be transformed from one geometrical configuration to other.

Regarding Applicants' argument, that Smith et al fails to disclose how to introduce the stress-gradient (the internal bend stresses in the contact caused by external factor - see Fig. 7, 8 in Smith et al),

Examiner respectfully submits that Smith et al disclose how to introduce the stress-gradient (col. 5, lines 4-6).

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With regard to amended claims 4 and 7, Applicants argue that the prior art (Smith et al) does not teach a first volume of the transformable material being transformed to a second different volume with claimed quantitative characteristic of volume change.

Any engineering material possess transformable properties. Particularly, volume of Smith material will be changed with change of temperature, pressure and time of exposure to these factors. Since the type of the transformable material, its geometry, factors affecting the material deformability, and criteria for evaluation of volume change (it is unclear why 0.2 percent of linear change leads to 90 percent of volume change) are not claimed, it is assumed that the materials used by Smith et al are adapted to transform their volume with 90 percent of volume change at a combination of above mentioned factors. Also, the specification does not disclose that 90 percent of volume change is critical for the invention (p. 25, lines 18-20).

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Gilman whose telephone number is (703) 305-0847. The examiner can normally be reached on Monday-Friday, 10:30 a.m. - 8:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paula A. Bradley can be reached on (703) 308-2319. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

Alexander Gilman

A handwritten signature in black ink that reads "Alex Gilman". The signature is written in a cursive, flowing style.

May 5, 2003